

Distributional Impacts of Shadow Economy in Africa

Kayıtdışı Ekonominin Afrika'daki Dağılımsal Etkileri

Abstract

The twin policy syndromes of shadow economy and income inequality are the defining features of an African environment. Thus, the question of whether the former aggravates or reduces the latter's effects remains an empirical puzzle. This inquiry unravels the puzzle by examining the distributional impacts of shadow economy for a broad sample of 41 African economies for the period, 1991–2015. Employing a system generalized method of moments, the following findings are established. First, shadow economy-inequality widening hypothesis is consistently validated across the different inequality models. Second, shadow economy Kuznets hypothesis lent empirical credence through endorsement of a nonlinear relationship between shadow economy and income inequality. Third, the useful roles of path-dependent nature of income inequality, per capita Gross Domestic Product (GDP), financial development, and trade openness are hard to be ignored. Lastly, when an alternative relative net income share is used as a dependent variable, the empirical outcomes still retain the initial findings of shadow economy-inequality widening hypothesis and the shadow economy Kuznets hypothesis, respectively. In line with these empirical outcomes, policy implications are suggested.

Keywords: Africa, generalized method of moments, income inequality, Kuznets hypothesis, shadow economy

Öz

Kayıt dışı ekonomi ve gelir eşitsizliğinin ikiz politika sendromları, Afrika ortamının belirleyici özellikleridir. Bu nedenle, birincisinin ikincisinin etkilerini ağırlaştırması veya azaltması ampirik bir muamma olmaya devam etmektedir. Bu araştırma, 1991-2015 yılları arasında 41 Afrika ekonomisinden oluşan geniş bir örneklem için kayıt dışı ekonominin dağılımsal etkilerini inceleyerek bu konudaki gizemi çözmeye çalışmaktadır. Genelleştirilmiş Momentler Yöntemi kullanılarak aşağıdaki bulgular oluşturulmuştur. İlk olarak, kayıt dışı ekonomi-eşitsizliğin genişlediği hipotezi, farklı eşitsizlik modellerinde sürekli olarak doğrulanmaktadır. İkincisi, kayıt dışı ekonomi Kuznets hipotezi, kayıt dışı ekonomi ile gelir eşitsizliği arasında doğrusal olmayan bir ilişkiyi onaylayarak ampirik bir güven sağlamaktadır. Üçüncüsü, gelir eşitsizliğinin patika bağımlı doğası, kişi başına GSYİH, finansal gelişme ve ticari açıklığın değerli rollerini göz ardı etmek zordur. Son olarak, bağımlı değişken olarak ekonomi-eşitsizliği genişletme hipotezinin ve Kuznets hipotezinin ilk bulgularını korumaktadır. Son olarak, bu pratik sonuçlara paralel olarak, politika çıkarımları önerilmektedir.

Anahtar Kelimeler: Afrika, genelleştirilmiş momentler yöntemi, gelir eşitsizliği, Kuznets hipotezi, kayıt dışı ekonomi

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Introduction

The policy syndrome of inequality remains one of the greatest challenges faced by every economy regardless of levels and stages of development. The World Inequality Report (2018) equally affirms the increasing trend of inequality across the world regions in recent decades. Little wonder that tackling of inequality continues to feature in most international policy agendas. For instance, reducing inequalities and ensuring no one is left behind are central to achieving the Sustainable Development Goals (SDGs). Despite this, the United Nations General Assembly still recognizes in its declaration of the summit

the persistent nature of inequalities in wealth, income, and opportunities. A fine-grained perspective suggests inequality as spanning across various dimensions of human existence including social, economic, cultural, institutional, and political, respectively. However, of these various dimensions, this study focuses on economic inequality which often remains the most widely discussed among development experts, researchers, and policymakers alike. Arguably, some levels of inequalities have been argued as necessary in the economy since it offers incentives to entrepreneurs and constitutes a source of overall investment for the economy. This is what Nemcova and Zak (1997) referred to as “a socially acceptable inequality in the society.”

Notwithstanding, a growing body of theoretical and empirical literature still documented its adverse impacts on development outcomes including long-term growth (IMF, 2014; Voitchovsky, 2011); poverty reduction (Berardi and Marzo, 2015); political stability and conflict (Stewart, 2011) to mention a few. To the extent that income inequality has broader socioeconomic implications, any policy intervention that would lead to its reduction will be growth-enhancing as well as Pareto-improving in nature. To this end, unraveling what the determinants of income inequality are, its relationship with other development outcomes has consequently dominated the empirical research space to date.

It is worth noting however that several factors have been identified as drivers of income inequality in both the theoretical and empirical literature. These factors include but are not limited to economic development (Berg and Fink, 2008; Kuznets, 1955), financial development (Beck et al., 2007; Claessens and Perrotti, 2007; Demirguc and Levine, 2009; Fabrizio et al., 2017), institutions (Alesina et al., 1999; Alesina and La Ferrara, 2005; Ostry et al., 2019), technology (Dabla-Norris et al., 2015; Jaumotte et al., 2013; Karabarbounis and Neiman, 2014), and fiscal policy (Clements et al., 2015; Fatas and Mihov, 2001; Ostry et al., 2014). In addition, rising income inequality has been found to have a more adverse consequence for females (Esteban Ortiz-Ospina and Roser, 2018; Mainardi et al., 2019).

A growing body of empirical literature has equally probed the relationship between shadow economy (SE) and income inequality. Shadow economy has been defined as “market-based production of goods and services, whether legal or illegal, that escape detection in the official estimates of GDP (Smith, 1994). To Yap et al. (2018), it simply connotes all unreported value-added activities. Why does it matter at all? Shadow economy remains a great deal of concern for the following reasons: (i) It is widespread because it accounts for about one-third of GDP and more than 70% of employment, of which one-half can be said to be self-employed. (ii) It has been linked to low productivity. This is particularly so as informal workers are paid less than their formal counterparts. (iii) It has also been linked to a wide variety of development concerns such as higher poverty level, low per capita income, lower human capital, as well as weaker investment. (iv) It is

associated with weak government capacity caused by low tax revenue, among other reasons.

In light of the foregoing narratives, it is worth stating that there are several channels through which SE can impact income distribution. First, SE can easily develop in a situation where people cannot be absorbed into the formal sectors, hence making them engage in informality as a means of closing the gap in income differentials, resulting from non-participating in the formal sectors. Second, engaging in SE can affect the general performance of an economy as most activities within the market are not recorded. This tends to affect both the total gross domestic income and per capita income on which income (re)distribution is based. Third, some corrupt well-to-do individuals often evade payment of taxes, thereby embracing the shadow markets as a way of concealing their true worth and status. This action often distorts economic policy planning and has distributional consequences. Fourth, government expenditure is often affected by low tax revenue orchestrated by high and rising activity of the SE. This low tax revenue has broad implications for widening the inequality gap resulting from lack of public goods or inadequate provision of it. In light of these presumed connections between SE and income inequality, it is thus surprising that an extensive body of empirical literature is yet to be documented on the relationship to date. This is troubling as these two policy syndromes have and continue to wax stronger across time and space. This is so, as the logic of connection is simple: joblessness that often results from not being absorbed into the formal sectors, arguably paves the way for the development of the SE with the expectation of narrowing down the income inequality gap between the rich and the poor in the society and vice versa.

This study contributes to the current debate with regard to the causal linkage between SE and income inequality in the following ways. First, unlike the previous studies that linked SE to income inequality, the study regresses SE on different measures of income inequality, including the Gini coefficient, the Atkinson index, the Palma ratio, the Theil index, and share of the lowest 10 as well as the share of the highest 10, respectively. This is novel in the SE-income inequality literature where attention is often focused on Gini coefficient which does not capture extreme values in the inequality distribution (Naceur and Zhang, 2016). This method of using different measures of inequality is consistent with the contemporary literature on inequality (see, Asongu and Odhiambo, 2020; Ajide and Alimi, 2021; Meniago and Asongu, 2018; Tchamyou et al., 2019). Second, this study focuses on Africa where the two phenomena co-exist. For instance, SE has been stated to account for well over 38% of the GDP (Medina and Schneider, 2018) in the continent. Income inequality on the other hand has been described as being an extreme case judging by international standards, with the top 10% taking 54% of national income and the bottom 50% sharing below 10% (see, Chancel et al., 2019). By implication, what goes to the top 10% is 30 times higher than that of the bottom 50%, well over the value found in other extreme inequality regions.

Apart from the introduction, the section “Literature Review” briefly reviews the literature, while the section “Data and Methodology” presents the data, theoretical framework, as well as the adopted methodological strategy. The section “Analysis of Results” discusses empirical findings and the section “Discussion and Conclusions” concludes with policy implications.

Method

Literature Review

Various definitions have been given of SE in the literature. Schneider et al. (2010) defined it as “all market-based legal production of goods and services that are deliberately concealed from public authorities to avoid payment of income, value added or other taxes.” This equally extends to include avoidance of payment relating to social security contributions, government bureaucracy, corruption law; non-observance of certain legal labor market standards such as minimum wages, safety standards, permissible working hours; as well as non-compliance with certain administrative procedures such as completing administrative forms and other statistical questionnaires. Feld and Schneider (2010) equally see it as “all currently unregistered economic activities that contribute to the officially calculated Gross Domestic Product.” Medina and Schneider (2018) also conceived it to mean “all economic activities which are hidden from official authorities for monetary, regulatory and institutional reasons. It is important to state that different names have been given to SE in both theoretical and empirical literature. These include hidden economy, informal economy, black economy, gray economy, or lack economy (see Medina and Schneider, 2018). Income inequality, on the other hand, literally connotes how unevenly income is distributed throughout a population. According to World Bank (2017), it is defined as the extent to which the distribution or consumption expenditure among individuals or households within an economy deviates from a perfect equal distribution. The more unequal the distribution, the higher the income inequality and vice versa.

Apart from the foregoing conceptual clarifications, the theoretical discussions linking SE to income inequality is undertaken in what follows. As has been earlier explained, people who are unable to be gainfully employed in the formal sectors, often engage in the informal sectors. By implication, people that are formerly unemployed in the formal sectors would be readily absorbed into the informal section of the economy. With such a movement, income inequality will tend to narrow down as monies will be realized in course of operating in such market. In this way, SE activities would have impacted income inequality. Also, people engage in SE in order to avert stringent rules and laws underlying the operation of the formal sectors. This would definitely reduce the bigger pie of national product or income, resulting from reduced tax revenue. Thus, as national income reduces, income distribution would ultimately be affected thereby worsening income inequality. This is so, as anything that affects economic growth may likely also affect redistributive justice as it were. In a similar vein, taxes that are

being evaded in the formal sectors, end up raising the shadow market activities thereby leaving more monies in the hands of the evaders than those operating in the formal sector where taxes will have to be paid. In this way, income distribution would have been distorted for selfish goals.

Apart from the supposed theoretical linkage between SE and income inequality, the empirical counterpart of this relationship is explicated in the subsequent subsection. Undoubtedly, an emerging strand of empirics had probed into the causal relationship between shadow economy and income inequality to date. In no particular order, Rosser et al. (2000, 2003), find a positive linear relationship between income inequality and SE for 16 transition economies. Studies including Chong and Grandstein (2007) and Pashardes and Polycarpou (2008) also establish similar results. Whereas Bhattacharya (2011) and Okumu (2014) find a contrary finding. At firm levels, using firm-level data from Mexico, Winkelried (2005) establishes that income inequality affects the aggregate demand behavior as well as influencing the firms’ incentives to join SE. Mishra and Ray (2010) equally unravel the relationship for 63 economies and 27,086 firms, respectively. They discover a higher degree of inequality leading to a bigger SE.

Quite recently, Yap et al. (2018) investigate the nonlinear relationship between SE and income inequality as well as determining whether the size of SE matters in income inequality. Using both parametric and non-parametric methods, for a panel of 154 countries over the period 2000–2017. The findings show income inequality as having a significant positive and nonlinear relationship with SE for both developed and developing economies. Specifically, SE bears a positive relationship with income inequality only within the range of thresholds of 18 and 65% but negative outside the range of these threshold points. Huynh and Nguyen (2019) examine the impact of SE on income inequality for 19 Asian countries between 1990 and 2015. Employing panel data estimators including fixed effects, random effects, and system generalized method of moments, they establish that SE significantly reduces income inequality. Specifically, they find out that SE increases the income share held by lowest quintile and reduces that of the highest quintile.

From the above expositions, the study’s first hypothesis is stated as follows:

$H_1 =$ SE will significantly impact income inequality.

Also, most of the studies that had been conducted in the relationship between SE and income inequality assume a linear relationship. However, both empirical and anecdotal evidences have shown that age and maturity stage of SE also matter in the income distribution of a country. Thus, to what extent does this apply to African continent remains an empirical concern? it is on this basis, the study specifies the second hypothesis thus:

$H_2 =$ There is a nonlinear relationship between SE and income inequality.

Having stated the hypotheses, it is important to mention that it is apparent that studies on the relationship between SE and income inequality are still evolving thus beaming future research light toward that direction seems salient. Apart from the paucity of empirical studies on the relationship, the novelty of this effort is undoubtable, at least, in two respects, first, with regard to the context: Africa and second, employing different measures of inequality such as Gini coefficient, Atkinson index, Palma ratio, Theil index, and the income shares of the highest quintile and the lowest quintile, respectively. This is considered important as emanating policy implications will be tailored toward a measure-specific dimension.

Data and Methodology

This study empirically unravels the role of SE on income inequality using various variables sourced from different databases including the World Development Indicators (WDI), Medina and Schneider, (2018) and the Global Consumption and Income Project (GCIP), respectively. The relationship between these two policy syndromes are assessed on a panel of 41 African economies over the period, 1990–2015. The countries Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, Cape Verde, Cameroun, Central African Republic, Chad, Comoros, Congo Dep, Congo rep, Cote d'Ivoire, Egypt, Ethiopia, Gabon, the Gambia, Ghana, Guinea, Guinea Bissau, Kenya, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Tanzania, Togo, Tunisia, Uganda, and Zambia.

Income Inequality

This measures the level of disparity in income of a country. It shows the concentration of income in the hand of fewer percentage of a country's population. Six different measures of income inequality are used. They are Gini coefficient, Theil coefficient, Atkinson coefficient, Palma ratio¹, share of the highest 10%, as well as the share of the lowest 10%, respectively. The data for capturing income inequality are sourced from GCIP. This database combines two separate datasets namely: The Global Consumption Dataset and the Global Income Dataset. The datasets detail both consumption and income of persons over time, within and across countries around the world. The GCIP is preferred over other inequality databases (such as Deininger and Squire, World Income Inequality Database) for the following reasons. First, it has a wider area and time coverage. Second, it incorporates a standardized welfare concept such as income and consumption, thus making within and cross-country comparisons meaningful. Third, it makes possible estimation of all inequality measures every year. Fourth, it offers access to tools for creating user-defined composites of countries in any given year. Lastly, it is flexible in updating the dataset and in choosing specific parametric or non-parametric estimations for the Lorenz curve.

Shadow Economy

According to Schneider and Enste (2002), SE is also referred to as an underground economy, informal economy, or parallel economy. It includes not only illegal activities but also unreported income from the production of legal goods and services, either from monetary or barter economic transactions. The SE includes all economic activities that would generally be taxable should they be reported to the relevant tax authority. The size of this economy is largely determined by tax rates, laws and regulations, as well as the existence of rule of law. Shadow economy may exert an influence on income inequality depending on the underlying factors determining it in the first place. For instance, income inequality tends to shrink up if formal markets cannot support the teeming unemployed population, thus paving way for the development of shadow markets or economy. As a consequence, people who are formerly redundant can now earn monies in the SE. The underlying data are obtained from Medina and Schneider (2018).

Other Covariates

The confounding variables used in this study are consistent with those of other previously conducted studies on growth-inequality nexus. The connection between GDP per capita and income inequality has witnessed substantial contributions in the development literature. The seminal contribution of Kuznets (1955) was the first theoretical proposition used in exploring the causal linkage between inequality and growth. The popular Kuznets' inverted-U curve postulates that income inequality tends to increase at an early stage of development and later decreases as the economy develops. This simply suggests that income inequality will fall as income continues to rise. However, this is mostly found applicable in developing economies. Thus, a negative relationship is hypothesized between per capita GDP and income inequality. Notwithstanding, the empirical counterpart of the above theoretical postulation has been largely diverse to date. While some empirics who established a positive relationship are Felbermayr and Groschl (2013) and Gygli et al. (2019) on the one hand, other studies equally lent empirical credence to a negative relationship on the other hand.

Infrastructural facilities are an important predictor of income inequality because it is a major facilitator of economic growth. It thus remains an important channel through which wealth can be distributed across members of society. Thus, in a situation where a country is infrastructurally deficit, the benefits that often come with infrastructures may elude such an economy, thereby leading to interregional or interpersonal income inequality. The finding is similar to per capita GDP. While studies such as Bajar and Rajeev (2015) and Mendoza (2017) found a positive relationship on the one hand, a negative relationship was established by Calderon and Serven (2004); Hooper et al. (2017) and Seneviratne and Sun (2013).

¹ We decide to use Atkinson and Palma inequality measures also because both Gini and Theil do not capture tails or extreme points of the inequality distribution.

Income inequality can also be reduced through effective and efficient financial intermediation. The financial Kuznets curve hypothesis, often referred to as Greenwood–Jovanovic (GJ) hypothesis, states that income inequality rises at the initial phase of financial development and reduces at the stage of financial maturity. In essence, the relationship between the two follows that of an inverted-U shape. Shahbaz and Islam found no relationship between the two for Pakistan between 1971 and 2005 whereas Sharbaz et al. (2015) confirmed the GJ relationship for Iran over the period 1965–2011. Law et al. (2014) also conducted a study on the relationship for a panel of 81 countries over the period 1985–2010. Using the threshold cointegration approach, they discovered the relationship between financial development and income inequality to have been moderated by institutional quality.

Fiscal policy is another route through which income (re)distribution can be influenced in an economy. This is so as government duties are erected on three basic fiscal policy functions, including stabilization, allocative, and redistributive, respectively. Apart from tax collection, the government can also use its expenditure tools to influence the direction of the economy. Thus, the government through transfer payments and provision of public goods and services such as education, health, and road construction can redistribute wealth across the people in a country. Though some authors have argued that high-income groups also benefit from public spending, they do not necessarily have to use public facilities and can as well pay for private goods. Sidek (2021) examined the impact of government expenditure on income inequality in a sample of 122 countries consisting of both developed and developing economies. Using dynamic panel threshold regression, he found out that government expenditure generally reduced income inequality. Similar results were found in Fournier and Koske (2012); Lustig (2011 and 2015); and Salverda and Checchi (2014). Whereas studies such as Arjona et al. (2001) and Schuknecht and Tanzi (2005) found a weak correlation between changes in government spending and income inequality.

The role of economic integration in income distribution has equally been widely acknowledged in both the theoretical and empirical literature. In the former case, Heckscher Ohlin Model postulates that inequality impact of trade openness arises from productivity differences and the relative factor endowment of countries, while the Stolper and Samuelson (SS) theorem posits that trade openness reduces inequality in developing countries and increases in developed economies. This is because integration increases the incomes of the owners of abundant factor resources (capital-intensive economies of advanced economies) and reduces that of the owners of scarce resources (labor-intensive economies of developing countries). However, the empirical counterparts of these propositions are largely mixed. Studies that found a positive relationship between trade openness and income inequality are Meschi and Vivarelli (2009) and Roser and Cuaresma, (2016) while a contrary finding was established by studies such as Bergh and Nilsson (2010); Jaumotte et al. (2013) and Lang and Tavares (2018).

Table 1.
Descriptive Statistics

Variable	Mean	Standard Deviation	Minimum	Maximum	Obs
<i>Principal outcome variables</i>					
gini	0.593	0.049	0.488	0.868	1050
atkin	0.706	0.068	0.510	0.924	1050
palma	6.742	2.294	3.016	22.916	1050
theil	0.667	0.099	0.396	1.165	1050
<i>Income shares</i>					
Decile 1	0.008	0.003	0.001	0.017	1050
Decile 2	0.016	0.004	0.004	0.028	1050
Decile 3	0.024	0.004	0.009	0.036	1050
Decile 4	0.032	0.005	0.014	0.046	1050
Decile 5	0.042	0.005	0.021	0.058	1050
Decile 6	0.055	0.006	0.029	0.072	1050
Decile 7	0.072	0.006	0.042	0.091	1050
Decile 8	0.098	0.006	0.063	0.117	1050
Decile 9	0.146	0.008	0.111	0.176	1050
Decile 10	0.506	0.040	0.382	0.701	1050
<i>Main explanatory variables</i>					
shadow1	38.830	8.420	19.230	66.610	1075
shadow3	1578.592	682.778	369.793	4436.892	1075
<i>Other control variables</i>					
lpgdp	6.995	1.010	5.102	9.398	1067
tel	2.947	4.941	0.000	31.067	1072
findep	20.475	24.237	0.403	160.125	1041
gexp	14.364	5.551	0.911	40.444	976
trade	65.801	27.230	20.964	165.646	1024

Source: Computed. Obs, Observations.

Table 1 displays the characteristics of the data used. From the table, the inequality captures with different measures including Gini coefficients, Atkinson, Palma, and Theil index have higher values, suggesting disparity levels as well as the widening gap between the rich and the poor. However, it is worth stating that dispersion from the means for each of these measures is low. The SE on the other end has a mean value of 38.83 with Nigeria and Mauritius having the highest (66.61) and lowest average (19.23) values, respectively. Table 2 shows the level of correlations between the variables. Other than the inequality measures that are strongly correlated given their higher values, all other variables are weakly correlated with the main outcome variables. Controlling for inequality measures with strong correlational values in the same model are impermissible but other confounders can be jointly or

Table 2.
Correlation Matrix

	gini	atkin	palma	theil	shadow2	shadow4	lpgdp	tel	findep	gexp	trade
gini	1.00										
atkin	0.84	1.00									
palma	0.93	0.85	1.00								
theil	0.96	0.89	0.95	1.00							
shadow	0.02	0.04	0.00	0.01	1.00						
shadowsq	0.02	0.04	0.00	0.01	1.00	1.00					
lpgdp	-0.05	-0.05	-0.03	-0.05	-0.39	-0.39	1.00				
tel	-0.07	-0.13	-0.07	-0.09	-0.60	-0.60	0.64	1.00			
findep	0.13	0.04	0.08	0.10	-0.58	-0.58	0.56	0.69	1.00		
gexp	0.20	0.15	0.24	0.23	-0.36	-0.36	0.26	0.19	0.32	1.00	
trade	-0.05	0.07	-0.02	-0.01	-0.35	-0.35	0.54	0.38	0.23	0.36	1.00

Source: Computed.

simultaneously accounted for. Thus, the low correlational values among other covariates are suggestive of the fact that the models are absolved of multicollinearity problems. In light of the information in Table 1 about the rising values of SE and inequality, would it then be appropriate to state that the former causes or significantly affect the latter? Jumping to such a conclusion is not scientifically permissible, thus informing further empirical investigation in the subsequent sections. The full description of the variables is displayed in Table 2A in the appendix.

Theoretical Framework and Empirical Strategy

This study is anchored on the benign perspective of informality which posits the relationship between formal and informal sectors as benign because the latter has the potential for a more adequate pattern of growth with a more egalitarian distribution of income (Tokman, 1978, p. 1066). To drive home his points, Tokman offers two leading hypotheses on economic reasons behind the benign view. These include the duality sub-approach and complementary sub-approach. The former sees an informal sector as an autonomous self-contained segment characterized by providing employment, goods, and services for the lower-income groups of the urban population. In effect, informal sectors are seen as economically efficient and possess comparative advantages to other similar activities operating in the formal sectors of the economy. The latter hypothesis supporting the benign perspective by viewing both the formal and informal sectors of the economy as complementary. It thus sees the formal sectors as highly integrated with the rest of the economy exporting three-quarters of its production and importing a similar proportion of its consumption (see Tokman, 1978, p. 1067 for further details).

In line with the foregoing framework, this study specifies an empirical model of the form:

$$ineq_{it} = \varphi_0 + \varphi_1 shadow_{it} + \varphi_2 shadowsq_{it} + \varphi_3 lpgdp_{it} + \varphi_4 tel_{it} + \varphi_5 findep_{it} + \varphi_6 gexp_{it} + \varphi_7 trade_{it} + \varepsilon_{it} \quad (1)$$

where $ineq_{it}$ represents income inequality captured with four measures, including Gini coefficients, Atkinson index, Palma ratio, and Theil index, i.e. income shares held by the highest and lowest quintiles of the population; $shadow_{it}$ is SE; $shadowsq_{it}$ is the square of SE; tel_{it} stands for telephone subscriptions per 100 people; $findep_{it}$ entails financial development captures via domestic credit to private sectors; $gexp_{it}$ equates government expenditures; $trade_{it}$ denotes trade openness. All these variables are for country i in period t . φ_0 is an intercept while φ_1 — φ_7 are the parameters to be estimated. ε_{it} is the disturbance term. It is worth noting that equation (1) above is the baseline model upon which other estimation techniques are based. Thus, equation (1) is estimated with pooled least square methods (OLS), panel fixed effects model, and random effects models. Owing to the inherent weaknesses (failure to account for endogeneity issues, simultaneity bias, reverse causality, and other measurement errors) characterizing these estimators, the study consequently engages the generalized method of moment (GMM) approach. This approach is consistent with the nature of the data employed. The GMM estimator remains a preferred approach due to the following reasons. First, the number of sampled countries is more than the number of time periods considered. That is 41 African countries as against 24 years (1991–2015). Second, the structure of the panel data allows to account for cross-country differences in the specifications. Third, the concerns relating to endogeneity, reverse causality, measurement errors, and simultaneity bias are resolved via internal instruments and inclusion of time-invariant indicators.

This study however chooses the Roodman (2009a,b) extension of GMM by Arellano and Bover (1995) over the traditional

GMM method. The rationale for this choice is predicated on the fact that the former approach has been documented to produce more efficient estimates as well as restricting instrument proliferation than the latter (see Baltagi, 2008; Boateng et al., 2018; Love and Zicchino, 2006, for further exposition).

The specifications (1) and (2) below summarize the standard system GMM procedure as follows:

$$ineq_{i,t} = \omega_0 + \omega_1 shadow_{i,t} + \omega_2 shadowsq_{i,t} + \sum_{h=1}^5 \vartheta_h con_{h,i,t-\tau} + \eta_i + \psi_t + \varepsilon_{i,t} \quad (2)$$

$$ineq_{i,t} - ineq_{i,t-\tau} = \omega_1 (shadow_{i,t-\tau} - shadow_{i,t-2\tau}) + \omega_2 (shadowsq_{i,t} - shadowsq_{i,t-\tau}) + \sum_{h=1}^5 \vartheta_h (convar_{h,i,t-\tau} - convar_{h,i,t-2\tau}) + (\psi_t - \psi_{t-\tau}) + (\varepsilon_{i,t} - \varepsilon_{i,t-\tau}) \quad (3)$$

Where, $eci_{i,t}$ is the income inequality of country i in period t , ω_0 is a constant, $shadow$ denotes SE, $shadowsq$ is the square of SE; $convar$ is a vector of other explanatory variables (these include per capita GDP, telephone subscription per 100 people, financial development, government expenditure, and trade), τ

stands for the coefficient of autoregression, η_i is the country-specific effect, ψ_t is the time-specific constant and $\varepsilon_{i,t}$ represents the disturbance term. For robustness, identification and exclusion restrictions underlying the GMM estimators are discussed. This study also considers all explanatory variables as predetermined while the time period is strictly exogenous because it is considered as invariant variable. This approach is supported by Roodman (2009b) and Boateng et al. (2018).

Results

Table 3 presents empirical findings of the causal relationship between SE and income inequality. First and foremost, the table offers supportive evidence for SE-inequality widening effect. Specifically, a significant positive impact of SE on income inequality runs across the models. By implication, SE serves as a complement to the growing income inequality in African society. Technically speaking, this finding confirms and authenticates SE Kuznets hypothesis. Interestingly, this is found to be statistically significant at the conventional level of 1% with the exception of the Atkinson coefficient that enters significantly at the 5% level. The positive *priors* on the coefficients of the variables of SE signify that most participants in the markets engage in shadow activities or businesses to

Table 3.
Empirical Estimates of Shadow Market on Income Inequality

Variables	Model 1	Model 2	Model 3	Model 4
Gini(lag)	0.889 (0.017)***	-	-	-
Atkin(lag)	-	0.976 (0.011)***	-	-
Palma(lag)	-	-	0.934 (0.011)***	-
Theil(lag)	-	-	-	0.952 (0.008)***
Shadow	0.134 (0.023)***	0.092 (0.032)**	5.53 (1.118)***	0.176 (0.053)***
Shadow squared	-0.015 (0.003)***	-0.011 (0.005)**	-0.643 (0.161)***	-0.022 (0.007)***
lpgdp	0.007 (0.003)**	0.004 (0.002)**	0.222 (0.115)*	0.207 (0.102)*
tel	-0.0003 (0.0002)	-0.0002 (0.0002)	-0.012 (0.008)	-0.001 (0.0002)***
findep	0.0001 (0.00005)**	0.0001 (0.0004)**	0.007 (0.002)***	0.0003 (0.00004)***
gexp	0.0002 (0.0001)	0.0002 (0.0001)	0.005 (0.005)	0.0001 (0.0001)
trade	0.0001 (0.00003)*	0.00004 (0.00003)	0.003 (0.001)**	0.0001 (0.00002)***
constant	-0.276 (0.050)***	-0.212 (0.026)***	-13.069 (2.313)***	-0.331 (0.098)***
AR(2)	0.226	0.316	0.037	0.148
Hansen test	0.432	0.470	0.631	0.577
Number of observations	894	894	894	894
Number of instruments	32	32	32	32
Number of groups	41	41	41	41

Note: 1%, 5%, and 10% signify statistical significant levels, representing ***, **, and *. The values in parentheses are the standard errors of the estimated models.

escape tax payments and other stringent rules of the formal markets. This action usually has adverse implications, as the government, that is supposed to provide some basic public goods that will bridge the disparity between rich and poor, may not be fiscally buoyant to do so. The consequence of this often results in widening the gap between these two extreme individuals in the society. This finding is largely consistent with previous studies such as Rosser et al. (2000, 2003); Schneider and Enste (2000); Chong and Grandstein (2007); Pashardes and Polycarpou (2008) and Yap et al. (2018). However, the squared of SE enters negatively across the model specifications, thereby lending empirical credence to the existence of a non-linear relationship between SE and income inequality. That is, the relationship between SE and income inequality is inverted-U shape in nature. The negative sign may be explained by the fact that as SE advances in age, income inequality reduces. This sounds plausible because people who are formerly fiscally incapacitated would have gotten over it as time passes by. This empirical outcome also aligns with Yap et al. (2018).

Apart from the findings of the primary variables, other confounders equally exert impact on income inequality. First, the path-dependent effects of all inequality measures are found to be statistically relevant at the 1% level across board. Meaning that the past experience of income inequality remains a driving factor behind its current movement. This is established for all inequality measures. Per capita GDP acts as an amplifier of income inequality in all the models except for model 4. Infrastructural facilities captured with the number of telephone subscriptions per 100 people do not wield any statistical influence on income inequality. This empirical outcome may be linked in part to infrastructural deficits the continent may have suffered for decades. Also, the financial development variable, albeit carries the expected signs, still exerts statistical influence on income inequality. The finding provides

support for finance-inequality widening hypothesis proposed by Rajan and Zingales (2003) and broadly consistent with empirics such as Jaumotte et al. (2013); Jauch and Watzka (2015) and Seven and Coskun (2016). This may be explained to have been due to a lack of access to finance by people that are credit-constrained in the economy. Even where such finances are available, the requirements may be burdensome for people who are in dire need. Government expenditure does not play any significant role in closing the gap between the rich and poor. This may not be unconnected to the large scale of corruption noticeable among the political office-holders and other government officials that are charged with responsibility of providing public goods and services. By implication, most of the government spending is not targeted at narrowing down the income inequality gap. Trade openness equally remains a spur to income inequality across the countries in the continent. This finding contradicts SS theorem, stating trade openness as reducing income inequality in developing economies but increases that of the developed countries. This empirical outcome simply confirms the earlier established findings by studies such as Meschi and Vivarelli (2009) and Roser and Cuaresma, (2016) but contradicts those of Winters et al. (2004); and Bergh and Nilsson (2014).

Exploring Alternative Measures of Income Inequality

Table 4 depicts the results of the impact of SE on income inequality when the relative net income shares (by deciles) are used as a dependent variable. This is explored in order to show which section of the population disproportionately gains or losses from SE in Africa. The table shows that SE increases the relative net income shares of the lowest income deciles. At the lower deciles (2, 3, and 4), the SE significantly remains an income inequality (captured by relative income shares) amplifier, corroborating the earlier established finding in Table 3. The statistical impacts appear to be more profound at the least of

Income Shares	Lag of Deciles	shadow	shadowsq	Control Variables	AR(2)	Hansen Test	Number of Instruments	Number of Countries	Number of Observations
Decile 1	0.978 (0.011)***	0.00002 (0.00001)	-0.002 (0.0005)***	Yes	0.327	0.463	32	41	894
Decile 2	0.976 (0.012)***	0.00004 (0.00002)**	-0.002 (0.001)***	Yes	0.189	0.482	32	41	894
Decile 3	0.965 (0.011)***	0.00003 (0.00002)*	-0.002 (0.001)***	Yes	0.200	0.433	32	41	894
Decile 4	0.956 (0.010)***	0.00003 (0.00002)*	-0.002 (0.001)***	Yes	0.243	0.668	32	41	894
Decile 5	0.945 (0.011)***	0.00002 (0.00002)	-0.002 (0.001)***	Yes	0.310	0.669	32	41	894
Decile 6	0.932 (0.010)***	0.00002 (0.00002)	-0.002 (0.001)***	Yes	0.375	0.601	32	41	894
Decile 7	0.916 (0.010)***	6.36e-06 (0.00003)	-0.001 (0.001)	Yes	0.357	0.609	32	41	894
Decile 8	0.894 (0.008)***	0.00004 (0.00002)*	-0.002 (0.001)	Yes	0.205	0.638	32	41	894
Decile 9	0.906 (0.009)***	0.0001 (0.0001)	-0.001 (0.003)	Yes	0.218	0.425	32	41	894
Decile 10	0.942 (0.007)***	-0.0003 (0.0002)*	0.016 (0.007)**	Yes	0.210	0.542	32	41	894

Note: 1%, 5%, and 10% signify statistical significant levels, representing ***, **, and *. The values in parentheses are the standard errors of the estimated models.

the decile of 2 at the 5% significance level, while the statistical relevance reduces to 10% for 3 and 4 deciles, respectively. The implication of this outcome is that SE increases inequality of the people belonging to the lower deciles. This can partly be explained by the fact that people often tend to leave the formal sectors to patronising SE, resulting from tax and regulatory burden, thus making government fiscal space to shrink. As the government fiscal capacity reduces, the provision of public goods and other welfare-improving services will be adversely affected, thereby widening the inequality gaps. The gaps appear to have substantial impacts on those in the category of lower deciles. This result sounds plausible as those in the lower deciles often constitute the majority in most developing African societies. Similarly, the positive impact of SE on relative net income share of the higher decile, specifically eighth, is also statistically strengthened but enters negatively at the topmost level of the decile (10). The negative impact of SE on those in the highest of the deciles (10), thus authenticating the income distributional bias of the SE. Interestingly, the squares of SE are negative from 1 to 6 deciles, confirming an inverted-U shaped nature of the relationship. However, the square of SE turns positive in the 10th decile, depicting the U-shaped nature of the relationship.

Discussion, and Conclusion and Recommendations

The twin policy syndromes of SE and income inequality have long remained the major challenging development concerns for policymakers, researchers, and development pundits alike. To the extent that any policy intervention directed at addressing these twin syndromes would promote the affected economy's long-run growth trajectory. Africa like other world continents is faced with these twin challenges. Specifically, the rising trend of SE coupled with the prevalent wide disparity in the distribution of income between the rich and the poor in Africa has called for concern. Appropriate intervention to stem the tide of the yawning income gaps between these categories of people would require digging deeper into the possible causes. Of the fundamental and proximate drivers thus far considered in the empirical literature, the possible role of SE has been grossly undermined. Interestingly, SE-inequality expanding thesis has been lent empirical credence on 41 developing African economies over the period straddling 1991–2015. This empirical outcome does not significantly differ when alternative measure of inequality is engaged. Using a relative net income share as a dependent variable has naked the SE-inequality expanding thesis of those in the lowest deciles than affected the category in the topmost deciles.

In the light of the foregoing empirical revelations, a few relative policy implications are drawn. As the SE exerts an amplifying inequality impact on those in the lowest deciles than the category in the topmost deciles. It is thus advised that the government fiscal and administrative burden should be lessened in order to discourage the development of shadow markets. This seems salient as tax and regulatory burdens are an important reason why the people often opt for the shadow sector

of the economy in the first instance. Government's role as a mitigating apparatus to inequality policy syndrome is widely acknowledged. Thus, for government to access enough fiscal resources that would enable her to execute welfare-enhancing packages, determining the optimal fiscal threshold remains the magic wand. This is so as higher threshold values would affect her fiscal buoyancy adversely and below which her fiscal buoyancy will be enhanced. Achieving this feat would be impossible without factoring in the useful roles of other income distributional drivers such as access to finance, increasing per capita GDP, as well as curtailing unfettered trade liberalization. Future studies can explore comparative analysis with other world continents and taking country-specific orientation would enrich the knowledge toward settling on feasible solution menus to the twin persistent development challenges.

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References

- Ajide, K. B., & Alimi, O. Y. (2021). Income inequality, human capital and terrorism in Africa: Beyond exploratory analytics. *International Economics*, 165, 218–240. [CrossRef]
- Alesina, A., Baqir, R., & Easterly, W. (1999). Public goods and ethnic divisions. *Quarterly Journal of Economics*, 114(4), 1243–1284. [CrossRef]
- Alesina, A., & La Ferrara, E. L. (2005). Ethnic diversity and economic performance. *Journal of Economic Literature*, 43(3), 762–800. [CrossRef]
- Arellano, M., & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics*, 68(1), 29–51. [CrossRef]
- Arjona, R., Ladaique, M., & Pearson, M. (2001). *Growth, inequality and social protection* [Labour Market and Social Policy Occasional Paper 51]. Organisation for Economic Co-operation and Development.
- Asongu, S. A., & Odhiambo, N. M. (2020). Inequality thresholds, governance and gender economic inclusion in sub-Saharan Africa. *International Review of Applied Economics*, 34(1), 94–114. [CrossRef]
- Bajar, S., & Rajeev, M. (2015). *The impact of infrastructure provisioning on inequality: Evidence from India* [No. 35]. Global Labour University Working Paper.
- Baltagi, B. (2008). *Econometric analysis of panel data*. John Wiley & Sons.
- Beck, T., Demirgüç-Kunt, A., & Levine, R. (2007). Finance, inequality and the poor. *Journal of Economic Growth*, 12(1), 27–49. [CrossRef]

- Berardi, N., & Marzo, F. (2017). The elasticity of poverty with respect to sectoral growth in Africa. *Review of Income and Wealth*, 63(1), 147–168. Retrieved from <http://onlinelibrary.wiley.com/doi/10.1111/roiw.12.T203/abstract>
- Bergh, A., & Fink, G. (2008). Higher education policy, enrolment, and income inequality. *Social Science Quarterly*, 89(1, March), 217–235. [CrossRef]
- Bergh, A., & Nilsson, T. (2010). Do liberalization and globalization increase income inequality? *European Journal of Political Economy*, 26(4), 488–505. [CrossRef]
- Bergh, A., & Nilsson, T. (2014). Is globalization reducing absolute poverty? *World Development*, 62, 42–61. [CrossRef]
- Bhattacharya, P. C. (2011). Informal sector, income inequality and economic development. *Economic Modelling*, 28(3), 820–830. [CrossRef]
- Boateng, A., Asongu, S., Akamavi, R., & Tchamyou, V. (2018). Information asymmetry and market power in the African banking industry. *Journal of Multinational Financial Management*, 44, 69–83. [CrossRef]
- Calderon, C. A., & Servén, L. (2004). *The effects of infrastructure development on growth and income distribution*. Central Bank of Chile, Working Papers, No 270, September, 2004.
- Chancel, L., Cogneau, D., Gethin, A., & Myczkowski, A. (2019). *How large are African inequalities? Towards distributional national accounts in Africa, 1990-2017*. World Inequality Lab Working papers No 2019/13.
- Chong, A., & Gradstein, M. (2007). Inequality and institutions. *Review of Economics and Statistics*, 89(3), 454–465. [CrossRef]
- Claessens, S., & Perotti, E. (2007). Finance and inequality: Channels and evidence. *Journal of Comparative Economics*, 35(4), 748–773. [CrossRef]
- Clements, M. B. J., de Mooij, R. A., Gupta, M. S., & Keen, M. M. (2015). *Inequality and fiscal policy*. International Monetary Fund.
- Dabla-Norris, M. E., Kochhar, M. K., Suphaphiphat, M. N., Ricka, M. F., & Tsounta, M. E. (2015). *Causes and consequences of income inequality: A global perspective*. International Monetary Fund.
- Deininger, K., & Squire, L. (1997). Economic growth and income inequality: Reexamining the links. *Finance and Development*, 34(1), 38–41.
- Demirgüç-Kunt, A., & Levine, R. (2009). Finance and inequality: Theory and evidence. *Annual Review of Financial Economics*, 1(1), 287–318. [CrossRef]
- Esteban Ortiz-Ospina, E., & Roser, M. (2018). *Economic inequality by gender*. Our World in Data.
- Fabrizio, S., Furceri, D., Garcia-Verdu, R., Li, B. G., Lizarazo Ruiz, S. V., Mendes Tavares, M., Narita, F., & Peralta-Alva, A. (2017). *Macrostructural policies and income inequality in low-income developing countries* [IMF Staff Discussion Note 17/01]. International Monetary Fund. [CrossRef]
- Fatás, A., & Mihov, I. (2001). Government size and automatic stabilizers: International and intranational evidence. *Journal of International Economics*, 55(1), 3–28. [CrossRef]
- Felbermayr, G., & Gröschl, J. (2013). Natural disasters and the effect of trade on income: A new panel IV approach. *European Economic Review*, 58, 18–30. [CrossRef]
- Feld, L. P., & Schneider, F. (2010). Survey on the shadow economy and undeclared earnings in OECD countries. *German Economic Review*, 11(2), 109–149. [CrossRef]
- Fournier, J. M., & Koske, I. (2012). *Less Income Inequality and More Growth – Are They Compatible? Part 7. The Drivers of Labour Earnings Inequality – An Analysis Based on Conditional and Unconditional Quantile Regressions* [OECD Economics Department Working Papers, No. 930]. OECD Publishing.
- Gygli, S., Haelg, F., Potrafke, N., & Sturm, J.-E. (2019). The KOF globalisation index—revisited. *Review of International Organizations*, 14(3), 543–574. [CrossRef]
- Hooper, E., Peters, S., & Pintus, P. (2017). *To what extent can long-term investment in infrastructure reduce inequality? Direction Générale Des Études Et Des Relations Internationales Banque De France, Working Paper, No 624, March 2017*.
- Huynh, C. M., & Nguyen, T. L. (2020). Fiscal policy and shadow economy in Asian developing countries: Does corruption matter? *Empirical Economics*, 59(4), 1745–1761. [CrossRef]
- Huynh, C. M., & Nguyen, T. L. (2020). Shadow economy and income inequality: New empirical evidence from Asian developing countries. *Journal of the Asia Pacific Economy*, 25(1), 175–192. [CrossRef]
- International Myeloma Foundation (2014). *Retribution, inequality and growth. IMF Staff Discussion Note* (J. D. Ostry, A. Berg, & C. G. Tsangarides, eds.). Retrieved from www.imf.org/external/pubs/ft/sdn/2014/sdn1402.pdf
- Jauch, S., & Watzka, S. (2016). Financial development and income inequality: A panel data approach. *Empirical Economics*, 51(1), 291–314. [CrossRef]
- Jaumotte, F., Lall, S., & Papageorgiou, C. (2013). Rising income inequality: Technology, or trade and financial globalization? *IMF Economic Review*, 61(2), 271–309. [CrossRef]
- Karabarbounis, L., & Neiman, B. (2014). The global decline of the labor share. *Quarterly Journal of Economics*, 129(1), 61–103. [CrossRef]
- Kuznets, S. (1955). Economic growth and income inequality. *American Economic Review*, 45(1), 1–28.
- Lang, V. F., & Tavares, M. M. M. (2018). *The distribution of gains from globalization*. International Monetary Fund.
- Law, S. H., Tan, H. B., & Azman-Saini, W. N. W. (2014). Financial development and income inequality at different levels of institutional quality. *Emerging Markets Finance and Trade*, 50(suppl 1), 21–33. [CrossRef]
- Love, I., & Zicchino, L. (2006). Financial development and dynamic investment behavior: Evidence from panel VAR. *Quarterly Review of Economics and Finance*, 46(2), 190–210. [CrossRef]
- Lustig, N. (2015). *Inequality and fiscal redistribution in middle income countries: Brazil, Chile, Colombia, Indonesia, Mexico, Peru and South Africa* [Working Paper 410]. Center for Global Development.
- Lustig, N., Lopez-Calva, L. F., & Ortiz-Juarez, E. (2013). Declining inequality in Latin America in the 2000s: The cases of Argentina, Brazil, and Mexico. *World Development*, 44, 129–141. [CrossRef]
- Mainardi, G. M., Cassenote, A. J. F., Guilloux, A. G. A., Miotto, B. A., & Scheffer, M. C. (2019). What explains wage differences between male and female Brazilian physicians? A cross-sectional nationwide study. *BMJ Open*, 9(4), e023811. [CrossRef]
- Medina, L., & Schneider, M. F. (2018). *Shadow economies around the world: What did we learn over the last 20 years?* International Monetary Fund.
- Mendoza, O. M. V. (2017). *Infrastructure development, income inequality, and urban sustainability in the People's Republic of China* (No. 713). ADBI Working Paper.
- Meniago, C., & Asongu, S. A. (2018). Revisiting the finance-inequality nexus in a panel of African countries. *Research in International Business and Finance*, 46, 399–419. [CrossRef]
- Meschi, E., & Vivarelli, M. (2009). Trade and income inequality in developing countries. *World Development*, 37(2), 287–302. [CrossRef]
- Mishra, A., & Ray, R. (2010). Informality, corruption, and inequality. *Bath Economics Research Paper*, 13(10).
- Naceur, M. S. B., & Zhang, R. (2016). *Financial development, inequality and poverty: Some international evidence*. International Monetary Fund.
- Němcová, I., & Žák, M. (1997). *Hospodářská politika*. Grada.
- Okumu, I. M. (2014). *Essays on governance, public finance, an economic development* [PhD Thesis]. University of St Andrews
- Østby, G., Nordås, R., & Rød, J. K. (2009). Regional inequalities and civil conflict in sub-Saharan Africa. *International Studies Quarterly*, 53(2), 301–324. [CrossRef]
- Ostry, J. D., Berg, A., & Tsangarides, C. G. (2014). *Redistribution, inequality, and growth. IMF staff discussion notes*. International Monetary Fund.
- Pashardes, P., & Polycarpou, A. (2008). Income tax evasion, inequality and poverty. *Cyprus Economic Policy Review*, 2(2), 37–49.

- Rajan, R. G., & Zingales, L. (2003). The great reversals: The politics of financial development in the twentieth century. *Journal of Financial Economics*, 69(1), 5–50. [CrossRef]
- Roodman, D. (2009a). A note on the theme of too many instruments. *Oxford Bulletin of Economics and Statistics*, 71(1), 135–158. [CrossRef]
- Roodman, D. (2009b). How to do xtabond2: An introduction to difference and system GMM in Stata. *STATA Journal: Promoting Communications on Statistics and Stata*, 9(1), 86–136. [CrossRef]
- Roser, M., & Cuaresma, J. C. (2016). Why is income inequality increasing in the developed world? *Review of Income and Wealth*, 62(1), 1–27. [CrossRef]
- Rosser, J. B., Rosser, M. V., & Ahmed, E. (2000). Income inequality and the informal economy in transition economies. *Journal of Comparative Economics*, 28(1), 156–171. [CrossRef]
- Rosser, J., Rosser, M., & Ehsan, A. (2003). Multiple unofficial economy equilibria and income distribution dynamics in systemic transition. *Journal of Post Keynesian Economics*, 25(3), 425–447.
- Salverda, W., & Checchi, D. (2014). *Labour-Market Institutions and the Dispersion of Wage Earnings* [IZA Discussion Paper, No. 8220]. [CrossRef]
- Schneider, F., Buehn, A., & Montenegro, C. E. (2010). New estimates for the shadow economies all over the world. *International Economic Journal*, 24(4), 443–461. [CrossRef]
- Schneider, F., & Enste, D. H. (2000). Shadow economies: Size, causes, and consequences. *Journal of Economic Literature*, 38(1), 77–114. [CrossRef]
- Schneider, M. F., & Enste, D. (2002). *Hiding in the shadows: The growth of the underground economy*. International Monetary Fund.
- Schuknecht, L., & Tanzi, V. (2005). *Reforming public expenditure in industrialised countries: Are there trade-offs?* [Available at SSRN 647947].
- Seneviratne, M., & Sun, M. Y. (2013). *Infrastructure and income distribution in ASEAN-5: What are the links?* International Monetary Fund.
- Seven, U., & Coskun, Y. (2016). Does financial development reduce income inequality and poverty? Evidence from emerging countries. *Emerging Markets Review*, 26, 34–63. [CrossRef]
- Shahbaz, M., Loganathan, N., Tiwari, A. K., & Sherafatian-Jahromi, R. (2015). Financial development and income inequality: Is there any financial Kuznets curve in Iran? *Social Indicators Research*, 124(2), 357–382. [CrossRef]
- Sidek, N. Z. M. (2021). Do government expenditure reduce income inequality: Evidence from developing and developed countries. *Studies in Economics and Finance*, 38(2), 447–503. [CrossRef]
- Smith, P. (1994). Assessing the size of the underground economy: The Canadian statistical perspectives. *Canadian Economic Observer*, 11(10), 16–33.
- Stewart, F. (2011). *Horizontal inequalities as a cause of conflict. A review of CRISE findings* [World Development Report 2011 Background Paper]. Retrieved from <https://openknowledge.worldbank.org/handle/10986/9126>
- Tchamyou, V. S., Erreygers, G., & Cassimon, D. (2019). Inequality, ICT and financial access in Africa. *Technological Forecasting and Social Change*, 139, 169–184. [CrossRef]
- Tokman, V. E. (1978). An exploration into the nature of informal-formal sector relationships. *World Development*, 6(9–10), 1065–1075. [CrossRef]
- Voitchovsky, S. (2011). Inequality and economic growth. In B. Nolan, W. Salveddra & T. Smeeding (Eds.). *The Oxford handbook of economic inequality*. Oxford University Press.
- Winkelried, D. (2005). *Income distribution and the size of the informal sector*. Development and Comp Systems 05122005, EconWPA, University of Cambridge.
- Winters, L. A., McCulloch, N., & McKay, A. (2004). Trade liberalization and poverty: The evidence so far. *Journal of Economic Literature*, 42(1), 72–115. [CrossRef]
- World Bank (2017). *World Development Indicators (WDI)*. The World Bank.
- Yap, W. W., Sarmidi, T., Shaari, A. H., & Said, F. F. (2018). Income inequality and shadow economy: A nonparametric and semiparametric analysis. *Journal of Economic Studies*, 45(1), 2–13. [CrossRef]

Appendix

Table 2A. <i>Description of Variables</i>			
Variables	Signs	Measurements	Sources
<i>Inequality measures</i>			
Gini coefficient	Gini	This is a measurement of income distribution of a country's residents	Global Consumption and Income Project
Atkinson index	Atkin	This measures inequality by determining which end of the distribution contributed most to the observed inequality	Global Consumption and Income Project
Palma ratio	Palma	It is the ratio of the richest 10% of the population's share of gross national income divided by the poorest 40% share	Global Consumption and Income Project
Theil index	Theil	It measures an entropic "distance" the population is away from the "ideal" egalitarian state of everyone having the same income	Global Consumption and Income Project
<i>The main explanatory variable</i>			
Shadow economy	shadow	This measures the sum of deliberately concealed wages (including unregistered workers) and unreported business profits	Medina and Schneider (2018)
<i>Other covariates</i>			
Per capita GDP	Pgdp	GDP per capita (constant 2010 US\$)	World Development Indicators
Telephone	tel	Telephone subscriptions per 100 people	World Development Indicators
Financial development	findep	Domestic credits to private sector to GDP	World Development Indicators
Government expenditure	gexp	General government final consumption expenditure (% of GDP)	World Development Indicators
Trade openness	trade	Exports plus imports divided by GDP	World Development Indicators
Source: Compiled.			